

What is claimed:

1. A high porosity ceramic honeycomb substrate for use in an automotive catalytic converter system which exhibits improved light-off performance and comprises an inlet end, an outlet end, a multiplicity of cells with walls defined by a thickness of greater than 2.0 mil (0.0020 inch, 0.0508 mm), the honeycomb having a total porosity in the range of 45 to 75 %, a median pore size in the range of 2-10 micrometers and a coefficient of thermal expansion (CTE) (25-800°C) of less than  $15 \times 10^{-7}/^{\circ}\text{C}$ .
2. The honeycomb of claim 1 wherein the walls have a thickness in the range of 2.5 mil (0.0025 in., 0.0635 mm) to 7 mil (0.0070 in., 0.1778 mm).
3. The honeycomb of claim 2 wherein the walls have a thickness in the range of 2.5 mil (0.0025 in., 0.0635 mm) to 3 mil (0.0030 in., 0.0762 mm).
4. The honeycomb of claim 1 wherein the porosity is in the range of 50 to 65%.
5. The honeycomb of claim 4 wherein the porosity is 55%.
6. The honeycomb of claim 1 wherein the median pore diameter is in the range of 2 to 4 micrometers.
7. The honeycomb of claim 6 wherein the median pore diameter is 3 micrometers.
8. The honeycomb of claim 1 wherein the CTE (25-800°C) is less than  $10 \times 10^{-7}/^{\circ}\text{C}$ .
9. The honeycomb of claim 1 further having a modulus of rupture (MOR) strength, as measured on a cellular bar, in the range of 200-400 psi.
10. The honeycomb of claim 9 wherein the a modulus of rupture (MOR) strength is 350 psi.

11. A method for forming a high porosity ceramic honeycomb substrate for use in a catalytic converter system, comprising:
  - a) compounding a batch of components comprising:
    - i. ceramic powder material;
    - ii. a plasticizing binder system; and,
    - iii. 15-85 wt.% pore former, wherein the pore former has a mean particle size of 2-18 micrometers;
  - b) mixing the batch of components to form a plasticized mixture;
  - c) extruding the plasticized mixture through a die to form a green honeycomb body; and,
  - d) heating the green honeycomb body at a temperature and for a time sufficient to remove the pore former and to form a structure having a total porosity in the range of 45 to 75 %, a median pore diameter in the range of 2-10 micrometers and a coefficient of thermal expansion (CTE) (25-800°C) of less than  $15 \times 10^{-7}/^{\circ}\text{C}$ .
12. The method of claim 11 wherein the batch comprises 30-70 % by weight pore former with a median particle size of 3 to 8 micrometers.
13. The method of claim 11 wherein the ceramic powder material comprises a mineral or refined powder selected from the group consisting of cordierite, spinel, clay, talc, alumina, aluminum hydroxide, silica, and oxides of calcium, magnesium, boron, titanium, germanium, and the alkali and transition metals.
14. The method of claim 13 wherein the ceramic powder material comprises material having a chemical composition consisting essentially, by weight, of 11-17 % MgO, 33-41 %  $\text{Al}_2\text{O}_3$ , and 48-52 %  $\text{SiO}_2$ .
15. The method of claim 14 wherein the ceramic powder material comprises kaolinite clay, talc, alumina and silica.

16. The method of claim 11 wherein the plasticizing binder system comprises a cellulose ether binder, a surfactant component, an oil or oil-based component, and a water vehicle.
17. The method of claim 16 wherein the cellulose ether binder is selected from the group consisting of methylcellulose, methylcellulose derivatives and combinations thereof.
18. The method of claim 16 wherein the surfactant is stearic acid or oleic acid.
19. The method of claim 16 wherein the oil or oil-based component is a low molecular weight oil.
20. The method of claim 19 wherein the low molecular weight oil is polyalphaolefin.
21. The method of claim 11 wherein the pore former is a natural, synthetic or semi-synthetic material.
22. The method of claim 19 wherein the pore former is selected from the group consisting of carbon, graphite, starch, cellulose, natural and synthetic waxes.
23. The method of claim 22 wherein the pore former is a wax having a melting point of at least above 70°C.
24. The method of claim 23 wherein the high melting wax is selected from the group consisting of paraffin wax, microcrystalline wax, polyethylene wax, synthetic amides, chlorinated waxes, and dispersions thereof.
25. The method of claim 24 wherein the pore former is polyethylene wax or dispersions thereof.

26. The method of claim 16 wherein in step a) compounding the batch components comprises:
  - a) first, mixing a portion of the sinterable ceramic material with the pore former, wherein the pore former is in a liquid dispersion having solid loadings of less than 50 wt.%, the pore former having a mean particle diameter in the range of 2 to 18 micrometers;
  - b) drying, and thereafter screening the mixture of step a) to obtain a particulate material having a composition consisting essentially of 60-70 wt.% pore former, 10-20 wt.% ceramic material, and 5-20 wt.% water;
  - c) dry-blending the remaining sinterable ceramic material with the binder;
  - d) adding the dry blend resulting from step c) to the particulate mixture of step b);
  - e) further adding the surfactant component, the oil or oil-based component and the water vehicle.
27. The method of claim 26 wherein the pore former is polyethylene wax in a liquid dispersion.
28. The method of claim 16 wherein in step a) compounding the batch components comprises:
  - a) dry-mixing the sinterable ceramic material, binder and pore former; and,
  - b) adding the oil or oil-based component, the surfactant and water vehicle to the resulting dry blend.
29. The method of claim 28 wherein the pore former is powdered polyethylene wax.
30. The method of claim 11 wherein the plasticized mixture is extruded through a die to form a honeycomb structure.